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CLIMATOLOGICAL MEMORANDA, No 24.

Frequencies of snow depth within given ranges at selected stations in England, Wales and Northern Ireland.

By Pauline Haywood.

The data used in this memorandum were extracted from the climatological records of 27 Meteorological Office outstations. From these data frequencies were derived of the depths of undrifted snow at 0900 GMT, for a period covering ten winters from November 1946 to April 1956, for depths of 2 cm or less, 3-5 cm, 6-10 cm, 11-15 cm, 16-20 cm, 21-30 cm, 31-40 cm and over 40 cm. One inch is approximately equal to two and a half centimetres. A winter was taken as November to April inclusive.

The distribution of the stations whose data were used is shown in fig.1.

For the purposes of this memorandum only occasions when more than half the ground representative of the station was covered with snow were taken into consideration, the amount of coverage being indicated by the code figure for the 'state of ground'. When the state of ground figure indicated that more than half the ground had been covered, but no value was available for the depth of the snow, this was estimated from the daily rainfall measurements taking the temperatures into account.

The two most severe winters during the period under review were those of 1946-47 and 1954-55. A comparison of these winters was made by R.E. Booth[1] with notes on the synoptic developments leading to the cold weather, and on the snowfall of January to March 1947 and 1955. Maps were included showing the number of days with snow falling and with snow lying for the two periods. The synoptic developments leading to the severe winter of 1947 were also described by C.K.M. Douglas[2]. The snow of January and February 1955 was the subject of another paper by Booth[3] which included maps based on several hundred observations. The Climatological Atlas of the British Isles[4] contains maps showing the average number of days with snow falling and snow lying on low ground between 1912 and 1938.

In Britain, snow lying is one of the most variable climatological elements and averages have to be computed from widely different values in different years. For example, there was snow lying at West Raynham on 55 days in the 1946-47 winter, but no occasions of snow lying were recorded in the winter of 1948-49.

Orographic and coastal effects are often responsible for large local variations in amounts of snowfall, and aspect is also of importance, especially in strong winds when heavy drifting may occur. Snow lying at a level depth of 20 cm (8 inches) or more implies a risk of very serious drifting especially in hilly or undulating terrain.

Statistics based on only ten years of records of snow at low level stations must be treated with caution. Nevertheless the results of this analysis are thought to be of value, provided that it is remembered that long period averages may be appreciably different, that variations with altitude are considerable, and that depths of 20 cm or more may be associated with serious drifting.

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Table 1 gives the number of days with snow lying at 0900 GMT at depths within specified limits at each of the 27 stations. The top part of each table gives the number of days in each individual winter, and the lower part gives the number of days in the ten Novembers Decembers etc. combined. Within this table the stations have been arranged geographically, so that stations which are nearest to each other are also near in the table.

Table 1 is the basis of Fig.2. This contains histograms showing the number of occasions in ten winters when snow lying at 0900 GMT exceeded specified depths. In this figure the stations have been arranged in order of decreasing frequency of occasions of snow lying at all depths.

References

1. R.E. Booth. A comparison of the winters 1946-47 and 1954-55. M.O.3 Climatological Memoranda No.4 price 1/9d.

2. C.K.M. Douglas. The Severe winter of 1946 to 1947. Met. Mag. Vol.76 1947 pp.51-56.

3. R.E. Booth. The snow of January and February 1955. Met. Mag. Vol.84 1955 pp.129-137.

4. London. Meteorological Office. Climatological Atlas of the British Isles M.O.488 1952 Published by H.M.S.O. price £2. 12. 6d. nett.

TABLE 1

Number of days with snow lying at 0900 GMT at depths between specified limits

These values cover the ten winters between November 1946 and April 1956 using the six winter months November to April. The values in the top part of each table are for each individual winter and the lower part of the table gives the values for ten Novembers Decembers etc.

STATION	Acklington 138 ft.									Dishforth 106 ft./ Leeming 105 ft.								
Period \ Depth in cm.	0 to 2	3 to 5	6 to 10	11 to 15	16 to 20	21 to 30	31 to 40	over 40	TOTAL	0 to 2	3 to 5	6 to 10	11 to 15	16 to 20	21 to 30	31 to 40	over 40	TOTAL
1946-47	2	7	13	7	6	11	3	1	50	2	23	9	7	9	3			53
1947-48	1	2							3	1	2							3
1948-49		4							4	2	3							5
1949-50	1	3							4	1	4	1						6
1950-51	9	4	1	1	1				16	8	3	1	1					13
1951-52	10	1	3	2					16	8	1	1						10
1952-53	3	6	1						10	9	5							14
1953-54	2	5	4						11	3	4	7	1					15
1954-55	3	3	14	2	4	4	2	1	33	13	10	9						32
1955-56	6	11	8	3					28	7	13	9	5		2			36
TOTAL	37	46	44	15	11	15	5	2	175	54	68	37	14	9	5			187
November 1946-55																		
December 1946-55	8	8	2	1	1				20	3		1	3		2			187
January 1947-56	14	10	10	3					37	19	13	9		1				
February 1947-56	8	23	21	7	7	11	3	1	81	20	49	19	5	4	1			98
March 1947-56	7	5	11	4	3	4	2	1	37	12	6	8	6	4	2			38
April 1947-56																		29

STATION	Driffield 69 ft.									Finningley 20 ft./ Lindholme 21 ft.								
1946-47	1	23	12	6	8	4			54	1	2	7	7	15	21			53
1947-48		3							3	2	2							4
1948-49	2	1							3	3	1							4
1949-50	5								5		5							5
1950-51	5	10	6	4	2				27	6	2	2	1	1				12
1951-52	3	6	1						10	3	2							5
1952-53	2	7	5						14	3	1							4
1953-54	5	1	8						14	8	8	3						19
1954-55	7	12	7	1					27	11	10	3						24
1955-56	8	11	12	3	2	4			40	8	8	8	5	1				30
TOTAL	38	74	51	14	12	8			197	45	41	23	13	17	21			160
November 1946-55										1								1
December 1946-55	3	12	7	4	3				29	3	5	3	1	1				13
January 1947-56	14	22	3	1	1				41	16	13	4	3					36
February 1947-56	13	40	32	3	4	6			98	22	20	16	5	10	16			89
March 1947-56	8		9	6	4	2			29	3	3		4	6	5			21
April 1947-56																		

STATION	Waddington 224 ft./ Scampton 186 ft.									West Raynham 250 ft.								
Depth in cm. / Period	0 to 2	3 to 5	6 to 10	11 to 15	16 to 20	21 to 30	31 to 40	over 40	TOTAL	0 to 2	3 to 5	6 to 10	11 to 15	16 to 20	21 to 30	31 to 40	over 40	TOTAL
1946-47		4	8	10	10	23			55	1	5	2	14	12	10	7	4	55
1947-48	3	2	1	2					8		1							1
1948-49			1	3					4									
1949-50	5	1							6	1								1
1950-51	2	8	4						14	13	5							18
1951-52	7	1							8	5	2							7
1952-53	8	2	2	1					13	11	2							13
1953-54	4	5	7	5					21	4	9	4						17
1954-55	3	11	13	2					29	6	18	9	2	1				36
1955-56	8	4	12	7		1	2		34	9	7	3	3	3				25
TOTAL	40	38	48	30	10	24	2		192	50	49	18	19	16	10	7	4	173
November 1946-55		1							1	1								1
December 1946-55	10	6	4						20	14	4							18
January 1947-56	14	11	17	4		1	2		49	25	12	1	3					41
February 1947-56	13	15	19	15	7	18			87	7	23	13	15	14	7	1		80
March 1947-56	3	4	8	11	3	5			34	3	10	4	1	2	3	6	4	33
April 1947-56		1							1									
STATION	Mildenhall 15 ft.									Cranfield 348 ft.								
1946-47	17	16	5		2				40	1	12	10	20	1	4	5	2	55
1947-48	3	1							4		1							1
[illegible]	3								3		1							1
[illegible]											1							1
[illegible]	5	2							7	13								13
[illegible]	5	2							7	5	3							8
[illegible]	8	2							10	15	7							22
[illegible]	5	4	1						10	4								4
[illegible]	14	5	5	2					26	12	10	6	3					31
[illegible]	10	8							18	9	4	5						18
TOTAL	70	40	11	2	2				125	59	39	21	23	1	4	5	2	154
November 1946-55	2								2	2	3							5
December 1946-55	3	4							7	17	6							23
January 1947-56	20	11	1						32	20	7	7						34
February 1947-56	36	22	6	2					66	17	14	11	19		2	4		67
March 1947-56	9	3	4		2				18	3	9	3	4	1	2	1	2	25
April 1947-56																		
STATION	Edgbaston 536 ft.									Shawbury 235 ft.								
1946-47		1	6	23	17	7	2	1	57	8	6	20	11	1	1			47
1947-48	2	8							10	3	1							4
1948-49		3	1						4	2	1	3						6
1949-50		2							2	2	1							3
1950-51	7	2	4	1	1	1			16	9	4	7		1				21
1951-52	7	4	1						12	4	2	2						8
1952-53	9	3	1		1				14	2	4	1	1					8
1953-54	8	4							12	5	2	9	2					18
1954-55	8	14	7	3	4				36	8	10	9	2	1				30
1955-56	6	9	14						29	12	8	2						22
TOTAL	47	50	34	27	23	8	2	1	192	55	39	53	16	3	1			167
November 1946-55	1	1							2	1								1
December 1946-55	9	8	4		1				22	10	3	5	1	1				20
January 1947-56	11	15	8	10	1	1			46	19	9	16	2					46
February 1947-56	21	21	18	10	20	1			91	18	24	27	8	1				78
March 1947-56	5	5	4	7	1	6	2	1	31	7	2	5	5	1	1			21
April 1947-56											1							1

STATION	Ross on Wye 223 ft.								
Depth in cm. / Period	0 to 2	3 to 5	6 to 10	11 to 15	16 to 20	21 to 30	31 to 40	over 40	TOTAL
1946-47		8	22	11	2				43
1947-48	2	2	1						5
1948-49		1							1
1949-50									
1950-51	6	4	2						12
1951-52	3	1							4
1952-53	3	5	7	1					15
1953-54	4	1	7	1					13
1954-55	5	4	7						17
1955-56	10	5	1						16
TOTAL	33	31	47	13	2				126
November 1946-55	2	2	2						6
December 1946-55	7	5	5						17
January 1947-56	8	10	12	2					32
February 1947-56	14	11	26	8					59
March 1947-56	2	3	2	3	2				12
April 1947-56									

STATION	Little Rissington 740 ft.								
Depth in cm. / Period	0 to 2	3 to 5	6 to 10	11 to 15	16 to 20	21 to 30	31 to 40	over 40	TOTAL
1946-47	7	6	2	14	8	18			55
1947-48	2	1							3
1948-49	1	2							3
1949-50	1								1
1950-51	8	4	3						15
1951-52	10		2						12
1952-53	7	8	7	2	3				27
1953-54	3	1	7	4					15
1954-55	14	8	9	3					34
1955-56	13	10							23
TOTAL	66	40	30	23	11	18			188
November 1946-55	5	1		2	1				9
December 1946-55	11	6	7		2				26
January 1947-56	21	12	12	2					47
February 1947-56	22	16	8	13	6	13			78
March 1947-56	7	5	3	6	2	5			28
April 1947-56									

STATION	Croydon 201 ft.								
1946-47	6	30	3	1					40
1947-48		2	1	1	2				6
1948-49	1	1	1						3
1949-50									
1950-51	4	3							7
1951-52	4	1	1	1					7
1952-53	3	1	1						5
1953-54	6	1							7
1954-55	11	2	1		1	1			16
1955-56	9	1							10
TOTAL	44	42	8	3	3	1			101
November 1946-55									
December 1946-55	4	3	1						8
January 1947-56	16	7	1		1	1			26
February 1947-56	20	27	4	2	2				55
March 1947-56	4	5	2	1					12
April 1947-56									

STATION	West Malling 304 ft.								
1946-47	1	25	4	7	6	1			44
1947-48	7	2							9
1948-49	2								2
1949-50	3								3
1950-51	4	2							6
1951-52	4	2	1	1					8
1952-53	2	3	2	2					9
1953-54	12	1							13
1954-55	6	7	4	2	1				20
1955-56	3	7	1						11
TOTAL	44	49	12	12	7	1			125
November 1946-55	1								1
December 1946-55	5	4							9
January 1947-56	8	4	6	6	5	1			30
February 1947-56	21	26	6	5	2				60
March 1947-56	9	12		1					22
April 1947-56		3							3

STATION	Tangmere 52 ft.								
1946-47	1	8	4	1		3			17
1947-48		2	2						4
1948-49									
1949-50									
1950-51	2	2	1						5
1951-52		2	1						3
1952-53	1	1							2
1953-54		4	5	3					12
1954-55	3	4	1						8
1955-56	4	1	1						6
TOTAL	11	24	15	4		3			57
November 1946-55									
December 1946-55	2	2	1						5
January 1947-56	4	8	2	2		2			18
February 1947-56	4	13	10	2		1			30
March 1947-56	1	1	2						4
April 1947-56									

STATION	Abingdon 210 ft.								
1946-47	6	4	23	3	2				38
1947-48									
1948-49									
1949-50									
1950-51	8								8
1951-52	2	1	2						5
1952-53	3	2	11						16
1953-54	6	3	1						10
1954-55	11		2						13
1955-56	15	3							18
TOTAL	51	13	39	3	2				108
November 1946-55	2		1						3
December 1946-55	6	2	9						17
January 1947-56	15	4	6						25
February 1947-56	28	7	20	1					56
March 1947-56			3	2	2				7
April 1947-56									

STATION	South Farnborough 226 ft.								
Depth in cm. / Period	0 to 2	3 to 5	6 to 10	11 to 15	16 to 20	21 to 30	31 to 40	over 40	TOTAL
1946-47	4	27	8	1					40
1947-48	1	2	2	1					6
1948-49		1							1
1949-50		1							1
1950-51	1	4	1	2	1				9
1951-52	3	2	1		1				7
1952-53	3	2							5
1953-54	8	3	4						15
1954-55	8	2	2						12
1955-56	10	8							18
TOTAL	38	52	18	4	2				114
November 1946-55									
December 1946-55	4	5	1						10
January 1947-56	11	9	5	2	1				28
February 1947-56	21	34	6	2					63
March 1947-56	2	3	6		1				12
April 1947-56		1							1

STATION	Boscombe Down 414 ft.								
Depth in cm. / Period	0 to 2	3 to 5	6 to 10	11 to 15	16 to 20	21 to 30	31 to 40	over 40	TOTAL
1946-47	14	14	5	5					38
1947-48	1	1							2
1948-49	1								1
1949-50			1	1					2
1950-51	7	1		2					10
1951-52	5	2	1						8
1952-53	2	2							4
1953-54	1	3	8	1	2				15
1954-55	10	4	1	1					16
1955-56	12								12
TOTAL	53	27	16	10	2				108
November 1946-55		1							1
December 1946-55	7	1	1	2					11
January 1947-56	9	4	4	4	2				23
February 1947-56	29	17	10	3					59
March 1947-56	8	3							11
April 1947-56		1	1	1					3

STATION	Squires Gate 33 ft.								
1946-47	7	3	1						11
1947-48									
1948-49	3								3
1949-50	2								2
1950-51	1	7	4						12
1951-52	1								1
1952-53	2			1					3
1953-54	4	8	4						16
1954-55	5	2	4	2	2	1			16
1955-56	5	1	2						8
TOTAL	30	21	15	3	2	1			72
November 1946-55									
December 1946-55	1	5	5	1					12
January 1947-56	6	8	6						20
February 1947-56	15	7	3	2	2	1			30
March 1947-56	8	1	1						10
April 1947-56									

STATION	Manchester Airport 248 ft.								
1946-47	15	2							17
1947-48	4								4
1948-49	2								2
1949-50			1						1
1950-51	7	1	7	2					17
1951-52	5	1							6
1952-53	4	2	1						7
1953-54	4	2	3		2				11
1954-55	6	5	8	2	1				22
1955-56	10	6	2						18
TOTAL	57	19	22	4	3				105
November 1946-55	1								1
December 1946-55	11	2	6	2					21
January 1947-56	11	5	4	1	1				22
February 1947-56	24	11	10	1	2				48
March 1947-56	10	1	2						13
April 1947-56									

STATION	Haverdon 15 ft.								
1946-47	1	18	24	1					44
1947-48									
1948-49	2								2
1949-50		1							1
1950-51	4	10							14
1951-52	4	3							7
1952-53	1	1	1	1					4
1953-54	5	1	4	4	3	1			18
1954-55	13	3	4	1					21
1955-56	12		4						16
TOTAL	42	37	37	7	3	1			127
November 1946-55									
December 1946-55	2	7	4	1					14
January 1947-56	11	17	2	1	3	1			35
February 1947-56	21	11	21	5					58
March 1947-56	8	2	10						20
April 1947-56									

STATION	Valley 26 ft.								
1946-47	6	6	2						14
1947-48									
1948-49									
1949-50	1								1
1950-51	3								3
1951-52		1	2						3
1952-53	1								1
1953-54	1	2							3
1954-55	3	5	1						9
1955-56	1	2	1	1					5
TOTAL	16	16	6	1					39
November 1946-55									
December 1946-55	4								4
January 1947-56	3	1	2						6
February 1947-56	7	14	4	1					26
March 1947-56	2	1							3
April 1947-56									

STATION	Plymouth (Mount Batten) 87 ft.									Exeter 106 ft.								
Depth in cm. / Period	0 to 2	3 to 5	6 to 10	11 to 15	16 to 20	21 to 30	31 to 40	over 40	TOTAL	0 to 2	3 to 5	6 to 10	11 to 15	16 to 20	21 to 30	31 to 40	over 40	TOTAL
1946-47	1	3	1	1		1			7	7	1							8
1947-48		1	2	1					4									
1948-49																		
1949-50										1								1
1950-51	3								3	3	4	2						9
1951-52	4								4	1								1
1952-53		1							1	1	1							2
1953-54	1								1	7								7
1954-55	1	3		1					5	4	1	1						6
1955-56	4	3	4	1					12	8								8
TOTAL	14	11	7	4		1			37	32	7	3						42
November 1946-55																		
December 1946-55	3	1							4	6	3	2						11
January 1947-56	4	1		2		1			8	8		1						9
February 1947-56	7	9	7	2					25	18	3							21
March 1947-56											1							1
April 1947-56																		

STATION	Aberporth 376 ft.								
1946-47	4	8	2	1	3	2			20
1947-48									
1948-49									
1949-50									
1950-51	6	2	1						9
1951-52	1	3							4
1952-53		1							1
1953-54									
1954-55	2	1							3
1955-56	1	2	2	1					6
TOTAL	14	17	5	2	3	2			43
November 1946-55		1							1
December 1946-55	2	2	1						5
January 1947-56	4	5							9
February 1947-56	7	7	4	1					19
March 1947-56	1	2		1	3	2			9
April 1947-56									

STATION	Aldergrove 217 ft.									Castle Archdale 225 ft.								
1946-47	7	12	4	3					26	2	3	5	6	3				19
1947-48	1	2							3	4	1							5
1948-49										2		2	1					5
1949-50	1								1	4								4
1950-51	1	2	9	2	3				17	13	6	6	1	2				28
1951-52	10	4							14	2	2	18						22
1952-53	1	1	2						4	1		2		1				4
1953-54	3								3	4	2							6
1954-55	5	11	2	1	1	1			21	2	6	2						10
1955-56	7	3							10	2	6	1						9
TOTAL	36	35	17	6	4	1			99	36	26	36	8	6				112
November 1946-55																		
December 1946-55		5	9	2					16	4	2	5	1	2				14
January 1947-56	21	9	2		3				35	13	13	23	1	1				51
February 1947-56	11	14	3	3	1	1			33	14	8	3	2	1				28
March 1947-56	3	7	3	1					14	4	3	5	4	2				18
April 1947-56	1								1	1								1

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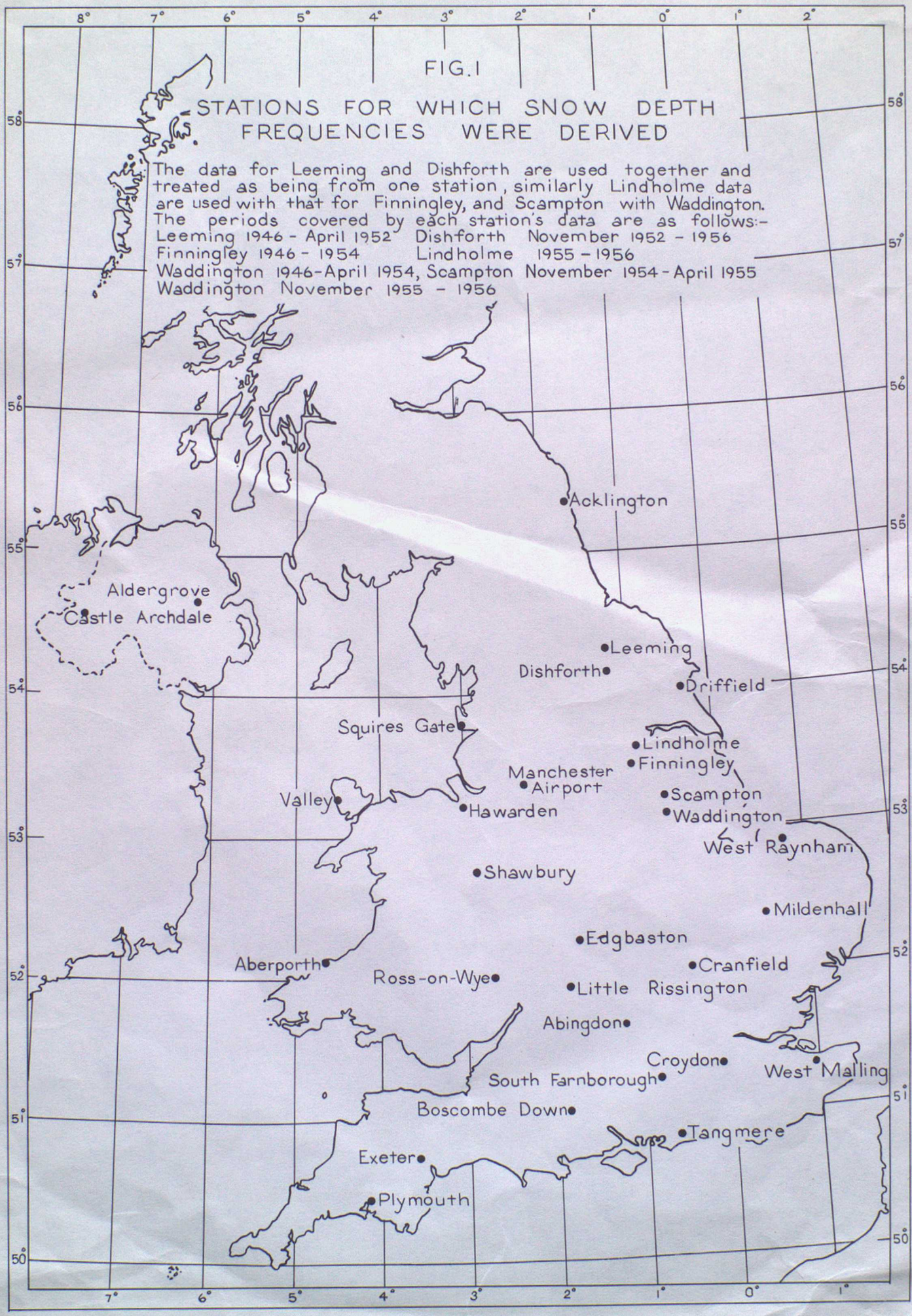
FIG.1
STATIONS FOR WHICH SNOW DEPTH FREQUENCIES WERE DERIVED
The data for Leeming and Dishforth are used together and treated as being from one station, similarly Lindholme data are used with that for Finningley, and Scampton with Waddington. The periods covered by each station's data are as follows:-
Leeming 1946 - April 1952 Dishforth November 1952 - 1956
Finningley 1946 - 1954 Lindholme 1955 - 1956
Waddington 1946-April 1954, Scampton November 1954 - April 1955
Waddington November 1955 - 1956
Acklington
Aldergrove
Castle Archdale
Leeming
Dishforth
Driffield
Squires Gate
Lindholme
Finningley
Manchester Airport
Scampton
Waddington
Valley
Hawarden
West Raynham
Shawbury
Mildenhall
Edgbaston
Aberporth
Cranfield
Ross-on-Wye
Little Rissington
Abingdon
Croydon
West Malling
South Farnborough
Boscombe Down
Tangmere
Exeter
Plymouth
8° 7° 6° 5° 4° 3° 2° 1° 0° 1° 2°
58° 57° 56° 55° 54° 53° 52° 51° 50°

FIG. 2

Histograms showing the number of occasions of snow lying at 0900 G.M.T., in excess of specified depths.

i) All depths

FIG. 2 continued